COURSE NUMBER: VM 335	**COURSE TITLE:** Heat Transfer
CREDIT: 3	**PREREQUISITES:**Vm320
TEXTBOOKS/REQUIRED MATERIAL: Incropera, DeWitt, Bergmann and Lavine, 2013, Fundamentals of Heat Transfer 6th ed.	**PREPARED BY:** Qiang Zhang **DATE OF PREPARATION:** Oct. 8, 2012 **DATE OF UC APPROVAL:** Oct. 30, 2013
INSTRUCTOR(S): Qiang Zhang	**SCIENCE/DESIGN:** n/a
CATALOG DESCRIPTION: Heat transfer by conduction, convection, radiation; heat storage, energy conservation; steady-state/transient conduction heat transfer; thermal circuit modeling; multidimensional conduction; surface radiation properties, enclosure radiation exchange; surface convection/fluid streams over objects, nondimensional numbers, laminar, turbulent, boiling and condensation; heat exchangers; design of thermal systems.	**COURSE TOPICS:** 1. Conservation of energy, energy conversion, storage, and heat transfer 2. Integral- and differential-volume energy equations, overview of elements in the energy equation 3. Physics of conductivity, Steady-state and transient conduction, thermal resistance and thermal circuit models and analysis 4. Physics of surface radiation, surface radiation properties, surface enclosure radiation exchange, thermal circuit modeling, nongray surfaces, inclusion of the heat transfer through the substrate 5. Surface convection of fluid streams passing over objects, Nusselt, Prandtl, Reynolds, analytical relations and correlations for the Nusselt number, thermal circuit diagram, inclusion of substrate heat transfer. 6. Laminar, turbulent, parallel, perpendicular, and thermobuoyant flows, boiling and condensation 7. Surface convection and convection of internal fluid streams, Number of Thermal Units and Effectiveness, Nusselt number correlations, heat exchangers
COURSE STRUCTURE/SCHEDULE: Lecture: twice per week, 90 minutes each.	

COURSE OBJECTIVES [Course Outcomes in brackets]	1. To make students familiar with fundamental heat transfer concepts: conservation of energy, mechanisms of energy conversion, and mechanisms of heat transfer (conduction, radiation, and convection) [1] 2. To teach balance of energy applied to integral- and differential-volumes and discuss finite-small volume applied in numerical analysis [1] 3. To teach the physics of thermal conduction in fluids and in solids (metals, plastics, ceramics) and composites such as insulation and define thermal conduction resistance [1, 2, 3, 4] 4. To teach the physics of thermal radiation and thermal surface properties [1, 2, 3, 4] 5. To show how heat is transferred by surface convection, between a moving fluid and a solid, link the heat transfer rate to fluid mechanics [1, 2, 3, 4]
COURSE OUTCOMES [Program Outcomes in brackets]	1. Formulate engineering and natural thermal systems in terms of conservation of energy [a, e] 2. Relate the rate of heat transfer to the potential for heat flow (difference in temperature) and thermal resistances 3. Determine these resistances for conduction, radiation, and convection heat transfer, using the fundamental relationships and correlations[a] 4. Learn to solve practical problems using solvers [a, e]
ASSESSMENT TOOLS [Course Outcomes in brackets]	1. Regular homework problems 2. Exams